

ABSTRACT OF THE DISCLOSURE

A wavelength tunable laser comprising a laser diode and a closed external cavity formed by one or more optical resonators either horizontally or vertically coupled to adjacent waveguides. The optical resonator primarily functions as a wavelength selector and may be in the form of disk, ring or other closed cavity geometries. The emission from one end of the laser diode is coupled into the first waveguide using optical lens or butt-joint method and transferred to the second waveguide through evanescent coupling between the waveguides and optical resonator. A mirror system or high reflection coating at the end of the second waveguide reflects the light backwards into the system resulting in a closed optical cavity. Lasing can be achieved when the optical gain overcomes the optical loss in this closed cavity for a certain resonance wavelength which is tunable by changing the resonance condition of the optical resonator through reversed biased voltage or current injection. Multiple optical resonators may be used to reduce the lasing threshold and provide higher power output. With monolithic integration, more optical devices can be integrated with the tunable laser into the same substrate to produce optical devices that are capable of more complex functions, such as tunable transmitters or waveguide buses.